REMARKS

Reconsideration and allowance of the claims are requested in view of the above amendments and the following remarks. Claims 1, 3, 5-6 and 17 have been amended. New claims 21-24 have been added. Claims 2, 4, 7-8 and 19 have been canceled without prejudice or disclaimer. Claims 1, 3, 5-6, 9-18 and 20-24 are now pending. No new matter has been added.

In the Office Action, claims 1-20 are rejected under 35 U.S.C. § 112 as failing to comply with the enablement requirement. Claims 1-6, 11, 13 and 15 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,117,627 to Runavot (hereinafter "Runavot"). Claims 1-9, 11, 13 and 15 are also rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,162,292 to Speeds *et al.* (hereinafter "Speeds"). Claims 1-7, 9, 11, 13, 15 and 17 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,490,972 to Ellion *et al.* (hereinafter "Ellion '972") and U.S. Patent No. 4,324,096 to Ellion *et al.* (hereinafter "Ellion '096"). Claims 1-9, 11, 13, 15-17 and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,931,832 to Berg *et al.* (hereinafter "Berg") in view of Ellion '972. Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over "any of the art applied above" in view of U.S. Patent No. 3,603,093 to Isley (hereinafter "Isley") in view of U.S. Patent No. 4,635,885 by Hujsak. Applicant traverse all of the rejections.

I. Section 112 Rejection

Applicant traverses the rejection of claims 1-20 under 35 U.S.C. § 112. For example, Applicant points out that claims 1, 2 and 17 are not inconsistent. The

previously recited "second amount" could be zero. Nonetheless, to expedite prosecution, Applicant has amended independent claims 1 and 17 to recite that the "control valve . . . passes substantially no propellant in the closed state during a second time period." Applicants believe that this will address the Office's concerns.

II. Novelty Rejection Over Runavot

Applicant traverses the rejection of independent claim 1 over Runavot and submits that Runavot fails to teach each and every element of amended claim 1. *See* MPEP § 2131.

Runavot teaches a basic catalytic decomposition propellant system. *See* Runavot at Abstract. The system of Runavot comprises a valve **1**, connected to a catalytic bed **4** via a capillary **2** and an injection chamber **3**. *See* Runavot at Figure 1, col. 1, ll. 21-26. From the catalytic bed **4**, gasses may escape to an expansion chamber **5** and a nozzle **6**. In use, the valve **1** of Runavot is opened to allow cold hydrazine fuel to spray into the injection chamber **3.** *See* Runavot at col. 1, ll. 45-59. The fuel makes its way to the catalytic bed **4**, where it decomposes, generating decomposition gasses that exit the system via the nozzle **6**, generating thrust.

Runavot teaches that it is important for the injection chamber **3** and injection capillary **2** to remain cool in order to prevent the hydrazine from vaporizing prior to decomposition and, thereby, causing impurity deposits on the catalyst, injection chamber **3** and capillary **2**. *See* Runavot at col. 2, ll. 15-24. Runavot teaches that impurity deposition is particularly acute when the system is pulsed. This is because, the greater the percentage of time that the cool hydrazine fuel is shut off, the hotter the capillary **2**, injection chamber **3**, and catalytic bed **4** become. The

hotter these components become, the more likely the hydrazine is to vaporize and deposit impurities. *See id.* Runavot's solution to this problem is to implement a "pseudo-continuous" mode, where the valve **1** is periodically closed for a short period of time and then re-opened. *See* Runavot at col. 2, ll. 43-62. The resulting changes in fuel pressure tend to expel impurities. Nonetheless, Runavot teaches that the periods where the valve is closed must remain short in order to prevent the catalyst and intake componentry from overheating. *See* Runavot at col. 3, ll. 22-40. For example, Runavot teaches that the valve **1** may be closed for between 0.38 to 0.6 seconds and that this closure may occur every seven to fifteen seconds. *See id.*

Applicant has herein amended claim 1 to recite that, "the control valve is configured to repeatedly transition between the opened state and the closed state such that a majority of the first amount of the propellant passed through the control valve during the first time period decomposes during the second time period." Applicant submits that Runavot fails to teach or suggest at least this feature.

The Office asserts that Runavot is "inherently capable" of allowing a majority of the propellant to decompose during the second time period. Applicant first points out that, to anticipate a claim, the reference must teach each and every element of the claim. *See* MPEP § 2131. Applicants do not concede that the system of Runavot is capable of operating in the claimed manner. Even if it is, however, this does not mean that Speeds anticipates claim 1. It is not enough that a reference teach a structure that is capable of performing in a claimed manner. In order to anticipate, each and every element must be shown. *See id.*

Next, Applicant asserts that not only is the claimed feature not inherent in Runavot, but Runavot explicitly teaches away from it. A feature is "inherent" in a reference when the feature is "necessarily present," and would be "recognized by persons of ordinary skill." *See* MPEP § 2112(IV). According to Runavot, the time period where the valve **1** is open is between about 11 and about 39 times longer than the time that the valve **1** is closed.[1] One of ordinary skill would recognize that according to these disclosed constraints, the system of Runavot cannot decompose more than half of the propellant to decompose while the valve **1** is closed. Further Runavot teaches away from increasing the period during which the valve is closed as this will increase heating and undesirable deposits. *See* Runavot at col. 2, ll. 22-37.

Because Runavot fails to teach each and every limitation of claim 1, Applicant submits Runavot fails to anticipate claim 1 as well as claims 3, 5-6, 9-16 and 21-22 that depend from claim 1. Further, because claim 17 includes limitations similar to those of claim 1 described above, Applicant submits that Runavot also fails to anticipate claim 17 and claims 18, 20 and 23 that depend directly or indirectly therefrom.

III. Novelty Rejections Over Speeds

Applicants traverse the novelty rejections over Speeds and submit that Speeds fails to teach or suggest all of the limitations of claim 1. *See* MPEP § 2131.

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[1] The lower bound of this range was found by dividing the shortest disclosed on period by the longest disclosed off period. The upper bound was found by dividing longest disclosed on period by the shortest disclosed off period.

Speeds teaches a system comprising a hydrazine fluid source **16**, an on-off valve **22**, an injector **24** and a generator **10** comprising a thermal bed **26** filled with heat-retaining balls **30**. *See* Speed at col. 3, ll. 4-50. In use, the valve **22** is cycled on and off. During the on periods, liquid hydrazine flows through the valve **22** and injector **24** into the generator **10**. Initially, the hydrazine is ignited by an I2O5 initiator. *See* Speeds at col. 4, ll. 45-65. The initial ignition of the hydrazine causes the thermal bed **26** to heat. The heat retained in the thermal bed **26** and heat-retaining balls **30** maintains the ignition of new hydrazine fuel as it enters the generator **10**. Speeds does teach that its system operates in a pulsed mode, however, the on/off ratio for the valve **22** is managed to "effect a 6:1 output flow range." *See* Speeds at col. 1, ll. 61-68. In other words, the valve **22** is "on" considerably longer than it is "off." Further, according to the teachings of Speeds, the valve must be "on" at a frequency sufficient to maintain the thermal bed **26** at a temperature that will cause decomposition of the hydrazine.

Applicant submits that Speeds, like Runavot, fails to teach or suggest that, "the control valve is configured to repeatedly transition between the opened state and the closed state such that a majority of the first amount of the propellant passed through the control valve during the first time period decomposes during the second time period," as recited by claim 1. The Office asserts that Speeds is "inherently capable" of operating in this manner. *See* Office Action at p. 4. Applicant again point out that it is insufficient for a reference to be "capable" of operating in a claimed manner. *See* MPEP § 2131. Further, the claimed method of valve operation is not only not inherent in Speeds, but Speeds teaches away. In the system of Speeds, the thermal bed **26** must remain hot. This is because, after

the initiator pack **28** of I2O2 is exhausted, the engine will only remain ignited as long as the thermal bed **26** is hot. Reducing the relative "off" time of the valve **22** such that a majority of the fuel decomposes while the valve is "off" would run the risk of allowing the thermal bed **26** to cool, destroying the functionality of Speeds' system.

Because Runavot fails to teach each and every limitation of claim 1, Applicant submits Runavot fails to anticipate claim 1 as well as claims 3, 5-6, 9-16 and 21 that depend from claim 1. Further, because claim 17 includes limitations similar to those of claim 1 described above, Applicant submits that Runavot also fails to anticipate claim 17 and claims 18, 20 and 21-22 that depend directly or indirectly therefrom.

IV. Novelty Rejections Over Ellion '972 and Ellion '096

Applicants traverse the rejections over Ellion '972 and Ellion '096. Applicants submit that the Ellion references fail to teach or suggest, "the control valve is configured to repeatedly transition between the opened state and the closed state such that a majority of the first amount of the propellant passed through the control valve during the first time period decomposes during the second time period." *See* MPEP § 2131. In fact, the Ellion references teach just the opposite.

The Office asserts that the Ellion references teach the above limitation because, "the time off, *i.e.*, between pulses will clearly accommodate more decomposition than the short time period of the pulses themselves." *See* Office Action at p. 6. Applicants do agree that the Ellion references teaches a pulsed mode where the time between pulses is greater than the duration of the pulses, as

shown in Figure 6 of Ellion '972. The amount of fuel that is decomposed during a pulse versus the amount that is decomposed between pulses, however, is not **only** a function of the pulse duty cycle. It also depends on the reaction properties of the fuel and the catalyst. For example, a system could have a very short pulse followed by a very long "off period," but if the fuel and catalyst react quickly, the majority of the fuel will still decompose during the pulse (*i.e.*, while the valve is open). This, in fact, is what the Ellion references teach. Ellion '96 shows a chamber pressure profile of one of its pulses at Figure 5. As is clearly illustrated the pressure drops precipitously near the end of the pulse. It is well known that in catalytic decomposition systems such as Ellion, chamber pressure is proportional to decomposition. Therefore, Figure 5 of Ellion demonstrates that fuel decomposition in the Ellion device takes place predominantly during a pulse (*e.g.*, while the valve **18** is open). Therefore, the Office's assertion that the long "time off" periods of Ellion '096 show imply more decomposition during the "time[s] off" is a misinterpretation of the Ellion references.

The Ellion references do not teach at least the limitation set forth above. Accordingly, Applicants submit that the Ellion references fail to anticipate claim 1 as well as claims 3, 5-6, 9-16 and 21 that depend from claim 1. Further, because claim 17 includes limitations similar to those of claim 1 described above, Applicant submits that the Ellion references also fail to anticipate claim 17 and claims 18, 20 and 21-22 that depend directly or indirectly therefrom.

V. Obviousness Rejection of Claims 1-7, 9, 11, 13, 15 and 17 over the Ellion References

At the outset, Applicant notes that the rejection at point #8, p. 8 of the Office Action is identified as being under § 102(b). Given the language, and the fact that a § 102(b) rejection of the same claims over the same references was previously made in the Office Action, Applicant will treat this rejection as if it is a rejection under 35 U.S.C. § 103(a).

Applicant traverses the obviousness rejection over the Ellion references, at least because (a) the Ellion references fail to teach or suggest, "the control valve is configured to repeatedly transition between the opened state and the closed state such that a majority of the first amount of the propellant passed through the control valve during the first time period decomposes during the second time period," as established above, and the modification of the Ellion references to reach the claimed invention are no longer merely a matter of finding "workable ranges;" and (b) the Office has utterly failed to provide a rationale to modify the Ellion references to arrive at the claimed invention.

First, Applicant has established above that Ellion fails to teach or suggest, "the control valve is configured to repeatedly transition between the opened state and the closed state such that a majority of the first amount of the propellant passed through the control valve during the first time period decomposes during the second time period." Accordingly, the Office has misconstrued the prior art and failed to establish *prima facie* obviousness.

Second, the Office has completely failed to provide a rationale to modify the Ellion references to arrive at the claimed invention. *See* MPEP § 2141(III) ("The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of

the reasons why the claimed invention would have been obvious."). In its rejection, the Office writes, "[t]o the extent that it is not specifically disclosed, **it is regarded as** an obvious matter of finding the workable ranges in the art as Ellion specifically controls the valve timing in a manner analogous to applicant." *See* Office Action at pp. 8-9. Basically, the Office is saying that because Ellion "controls valve timing in a manner analogous to applicant," that the claimed operating conditions are obvious. The Office fails to show that the claimed ranges are "workable" in the structure disclosed for the Ellion references.

For at least the reasons given above, Applicant submits that no *prima facie* obviousness has been established for independent claim 1 as well as claims 3, 5-6, 9-16 and 21 that depend from claim 1. Further, because claim 17 includes limitations similar to those of claim 1 described above, Applicant submits that, for the same reasons, no *prima facie* obviousness has been established for claim 17 and claims 18, 20 and 21-22 that depend directly or indirectly therefrom.

VI. Obviousness Rejections Over Berg and Ellion '972

Applicants traverse the rejection of independent claims 1 and 17 as being obvious over Berg and Ellion. Applicants submit that no *prima facie* obviousness has been established because the Office has misconstrued the scope and content of the prior art. *See* MPEP § 2141(II). Applicant has established above that the Ellion references fail to teach or suggest, "the decomposition chamber comprises a plurality of chamber beds, first chamber bed comprising catalyst particles of a first size and a second chamber bed comprising catalyst particles of a second size, the first chamber bed is closer to the control valve than the second chamber bed, and

the first size is larger than the second size," as recited by claim 1. Applicant submits that Berg also fails to teach or suggest at least this feature. In fact, the embodiment taught by Berg comprises only a single decomposition chamber. *See* Berg at Figure 1, col. 2, ll. 55-61.

For at least the reasons given above, Applicant submits that no *prima facie* obviousness has been established for independent claim 1 as well as claims 3, 5-6, 9-16 and 21 that depend from claim 1. Further, because claim 17 includes limitations similar to those of claim 1 described above, Applicant submits that, for the same reasons, no *prima facie* obviousness has been established for claim 17 and claims 18, 20 and 21-22 that depend directly or indirectly therefrom.

VII. Reservation of Arguments

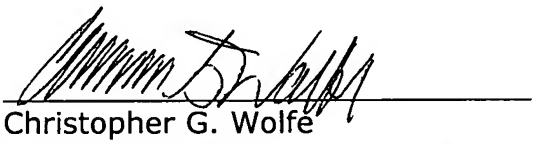
Applicant is not otherwise conceding, however, the correctness of the Office's rejections with respect to any other claims and hereby reserve the right to make additional arguments as may be necessary because the independent and dependent claims include additional features that further distinguish the claims from the cited references, taken alone or in combination. A detailed discussion of these differences is believed to be unnecessary at this time in view of the basic differences pointed out above.

CONCLUSION

Applicant believe that they have fully addressed the rejections of the Office Action. Reconsideration of the claims of the subject application and issuance of a Notice of Allowance is respectfully requested. Should the Examiner have any remaining concerns, he is requested to contact the undersigned at the telephone number below so that those concerns may be addressed without the necessity for issuing an additional Office Action. Please charge any additional fees necessary for consideration of this Amendment and Response to Office Action to charge account number 11-1110.

Respectfully submitted,

Date: 1/14/10



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